



## SECTION 725

### METAL PIPE AND PIPE-ARCH CULVERTS

#### 725.1 Description.

**725.1.1** This work shall consist of providing corrugated metal pipe or pipe-arch of the diameter or shape designated, laid upon a firm bed and backfilled as specified. Where pipe is referred to, this specification shall also apply to pipe-arch where appropriate.

**725.1.2** The contract will specify either the type of pipe or the group of permissible types of pipe. If Group B pipe is specified, the contractor shall use any of the types listed as follows:

Reinforced Concrete Pipe  
Corrugated Metallic-Coated Steel Pipe  
Corrugated Aluminum Alloy Pipe  
Corrugated Polyethylene Pipe

**725.1.3** If the contract specifies corrugated metallic-coated steel pipe culverts of 60-inch (1500-mm) diameter or larger, the contractor may substitute structural plate pipe of like sizes, lengths and thicknesses of steel, constructed in accordance with the requirements of [Sec 727](#) at no additional cost to the Commission.

**725.1.4** If the contract specifies corrugated metallic-coated steel pipe or corrugated aluminum alloy pipe, or if the contract specifies pipe culverts by group and the contractor elects to furnish corrugated metallic-coated steel pipe or corrugated aluminum alloy pipe, the thickness of metal and size of corrugation for the respective pipe size shall be as shown on the plans unless otherwise specified. The overfill height shown on the plans or in the contract shall be used to determine the proper sheet thickness and size of corrugation for the individual pipe culvert. The minimum cover shall be measured from top of pipe to the bottom of the pavement.

**725.1.5** If the contract specifies pipe culverts by group and the contractor elects to furnish vitrified clay or reinforced concrete pipe, the culvert shall be constructed in accordance with [Sec 726](#). If the contractor elects to furnish corrugated polyethylene pipe, the culvert shall be constructed in accordance with [Sec 730](#).

**725.1.6** The thickness of metal, type of coating or size of corrugation shall not be changed throughout the length of any individual pipe culvert.

**725.1.7** The type of pipe permitted in extending an existing pipe shall be the same type used in place, except as otherwise specified in the contract, or unless prohibited by any of the requirements set out herein.

#### 725.2 Material

**725.2.1** All material shall conform to Division 1000, Materials Details, and specifically as follows:

Item	Section
Corrugated Metallic-Coated Steel Culvert Pipe, Pipe-Arches and End Sections	1020
Corrugated Aluminum Alloy Culvert Pipe	1024
Bituminous Coated Corrugated Metal Culvert Pipe, Pipe Arch and End Sections	1021

### Construction Requirements

**725.3 Handling.** All pipe shall be unloaded and handled with reasonable care. Pipe shall not be dragged over gravel or rock and shall be prevented from striking rock or other hard objects during placement on bedding. Pipe with protective coatings shall be handled with special care to avoid damage. Pipe on which such coatings have been damaged shall, unless repaired to the satisfaction of the engineer, be rejected at the site of the work regardless of previous approvals. Pipe having any localized bends in excess of 5 percent of the specified pipe diameter or any dent in excess of ½ in. (13 mm) shall be rejected. Rejected damaged pipe may be used if repaired to the satisfaction of the engineer. Repair may be made by jacking or by any other method meeting the approval of the engineer.

### 725.4 Laying Pipe.

**725.4.1** The pipe shall be carefully laid true to lines and grades shown on the plans. Riveted pipe shall be installed with the outside laps of circumferential joints pointing upstream and with no longitudinal lap placed on the bottom 120° of the pipe on the sides. Any pipe which is not in true alignment or which shows any undue settlement after laying shall be taken up and re-laid at the contractor's expense. If shown on the plan or directed by the engineer, camber shall be built into the pipe structure to compensate for settlement from fill loads.

**725.4.2** Transverse field joints shall be of such design that the successive connection of pipe sections will form a continuous line free from appreciable irregularities in the flow line. Each successive length of pipe in a field joint shall be adjusted longitudinally or circumferentially when necessary so that coupling bands will properly engage the corrugations in both lengths of pipe. Bands with projections or dimples shall not be used.

### 725.5 Bedding & Backfill Material.

**725.5.1** Backfill material for metal culverts shall consist of gravel, sand or sandy silt soil as shown on the plans.

**725.5.1.1** Gravel and sand shall consist of a well-graded mixture of stone fragments, gravel and sand and shall meet the requirements of AASHTO M 145, classification A1 or A3.

**725.5.1.2** Sandy silt soil shall consist of moderately plastic granular material with silt content higher than that of gravel or sand and shall meet the requirements of AASHTO M 145, Classification A2.

**725.5.2** Bedding material shall have a maximum particle size of 1.5 inches (38 mm). Backfill shall be free of organic material or frozen clumps and shall not contain stones larger than 3 inches (75 mm).

### 725.6 Installation.

**725.6.1 Installation of Pipe for Non-Embankment Conditions.** The construction sequence shall be as follows: the trench shall be excavated to the width, depth and grade shown on the

plans and approved by the engineer. Proper preparation of foundation, placement of foundation material where required and placement of bedding material shall precede the installation of all culvert pipe. This shall include necessary leveling of the native trench bottom or the top of the foundation material as well as placement and compaction of required bedding material to a uniform grade so that the entire length of pipe will be supported on a uniform base. The material in the haunch and lower side zones shall then be placed and compacted up to the springline of the pipe.

**725.6.2 Installation of Pipe Prior to Placing Embankment.** After the pipe has been laid, the material in the haunch and lower side zones shall be placed to a minimum width of one pipe diameter outside the pipe, except for pipe-arches, where it is limited to a maximum of two-thirds the span. The pipe shall be installed and backfilled according to the requirements of [Sec 725.6.1](#). If a subtrench is required to install the pipe to the specified grade, the width of the trench shall be as shown on the plans. Sufficient clearance shall be provided in order to attain the required compaction in the haunch and outer bedding zones.

**725.6.3 Installation of Pipe After Placing Embankment.** The roadway embankment shall be placed and compacted to the required density to a minimum elevation of 1 foot (300 mm) above the top of the pipe. A trench, conforming to the section shown on the plans shall be excavated through the embankment to a depth sufficient to place the required bedding and maintain the specified grade of the pipe. The pipe shall be installed and backfilled according to the requirements of [Sec 725.6.1](#).

**725.6.4 Bedding in Unsuitable Material.** If rock is encountered, the bedding depth shall be increased as shown on the plans. If soft, spongy or unstable material is encountered, it shall be removed and replaced with soil compacted to the level specified. Payment for removal of unsuitable material and for backfilling will be made in accordance with [Sec 206.6.3](#), unless the unsuitable material is a result of the contractor's operations in which case the removing and backfilling shall be at the contractor's expense.

**725.6.5 Backfilling.** Backfilling shall be done as soon as practicable. Suitable backfill and embankment material free from large lumps, clods or rocks, shall be placed alongside the pipe in loose layers not exceeding 8 inches (200 mm) thick to provide a berm of compacted earth, on each side of the pipe, at least as wide as the diameter of the pipe. Each 8-inch (200-mm) layer shall be thoroughly compacted to the same density required for the adjacent embankment or to a minimum of 90-percent standard density. Backfill material may be moistened to facilitate compaction. Special care shall be taken to properly compact the backfill under the haunches of pipe-arch. The placement of the remainder of the backfill to at least 1 foot (300 mm) above the top of the pipe shall be brought up evenly on both sides of the pipe by working backfill operations from side to side. The side to side backfill differential shall not exceed 24 inches (0.6 m) or 1/3 of the size of the pipe, whichever is less. Additional backfill shall be provided as necessary. Backfill shall be compacted to a minimum of 90 percent standard maximum density or otherwise specified embankment density.

**725.6.6 Shop Elongation.** Round corrugated steel pipe of 54 inches (1350 mm) or greater in diameter shall be shop elongated. Corrugated steel pipe 48 inches (1200 mm) in diameter may be furnished round or shop elongated. The contractor shall be responsible for maintaining elongation during backfilling and embankment construction such that the vertical height of the opening after the embankment has been completed shall be not less than the diameter of the pipe, nor greater than the pre-elongated height.

**725.6.7 Construction Loads.** Before heavy construction equipment is operated over the pipe, the contractor shall provide adequate depth and width of compacted backfill to protect it from damage or displacement as shown on the plans. Any damage or displacement shall be repaired or corrected at the contractor's expense.

**725.6.8 Pipe Plugs.** The ends of all pipe stubs for future connections at inlet and manhole structures and all pipe installed as part of future sewers shall be sealed with suitable plugs. The plugs shall be installed in a manner preventing infiltration of soil into the pipe. No direct payment will be made for furnishing and installing plugs.

**725.7 Corrugated Metal Drop Inlets.** The contractor shall install corrugated metal drop inlets of the proper size and length at the locations shown on the plans. The drop inlet shall be constructed of the same base metal and thickness of corrugated metal used in the culvert pipe and shall meet all applicable requirements of [Sec 1020](#) or [1024](#).

**725.8 Corrugated Metal Curtain Walls.** The contractor shall install metal curtain walls of the proper size and shape at locations shown on the plans. Metal curtain walls shall be constructed of the same base metal used in the culvert pipe, shall be of the thickness of metal shown on the plans and shall meet all applicable requirements of [Sec 1020](#) or [1024](#).

**725.9 Method of Measurement.**

**725.9.1** Measurement of corrugated metal pipe or pipe-arch, complete in place, will be made to the nearest foot (0.5 m) along the geometrical center of the pipe. Final measurement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

**725.9.2** Excavation for placing pipe, pipe-arches, corrugated metal drop inlets and metal curtain walls will be measured and paid for as Class 3 Excavation in accordance with [Sec 206](#).

**725.10 Basis of Payment.**

**725.10.1** The accepted quantities of pipe, complete in place, including all necessary tees, bends, wyes, coupling bands, cutting and joining new pipe to existing pipe or structures unless otherwise specified, will be paid for at the unit price for each pay item included in the contract.

**725.10.2** No direct payment will be made for beveling, skewing or additional work required in laying pipe with beveled or skewed ends, or work involved in elongating or backfilling required except as specified in [Sec 206.6.3](#).

**725.10.3** The accepted quantities of corrugated metal drop inlets, and metal curtain walls, complete in place including coupling bands, toeplates, nuts and bolts will be paid for at the unit price for each pay item included in the contract.